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PHYSICS.—*The emissivity of metals and oxides. IV. Iron oxide.*[1] GEORGE K. BURGESS and PAUL D. FOOTE, Bureau of Standards.

This paper is a continuation of the study of the radiometric properties of metals and oxides. By the use of radiation pyrometers and the method of microscopic melts described in the earlier papers, the total and monochromatic emissivity ($\lambda = 0.65\ \mu$) of iron oxide formed by heating iron in air has been determined at high temperatures.

Iron oxide in the spectral region $\lambda = 0.65\ \mu$ is almost "black," having an emissivity varying from 0.98 to 0.92 in the range 800° to 1200°C. The corrections necessary to apply to the readings of an optical pyrometer in this temperature range vary from 0° to 10°C. The total emissivity of iron oxide increases from 0.85 at 500°C. to 0.89 at 1200°C. The corrections necessary to apply to the readings of a radiation pyrometer in this temperature range vary from 30° to 50°C.

The temperature of the outside of the oxide layer is considerably different from that of the inside in contact with the metal, as a result, in part, of the low thermal conductivity of the oxide and, in part, undoubtedly, of the actual separation of the outside oxide layer from the metal, thus forming an air gap between the two surfaces or between two surfaces of oxide, the outer one thick and the inner one thin. The drop in temperature through

[1] To appear in full in the Bulletin of the Bureau of Standards.

tion in the great, down-warped, synclinal areas in South America in comparison with similar areas of the United States. Willis thought them very similar. In many places the areas are covered with woody or reedy vegetation and in some instances the conditions are apparently favorable for the formation of flat deposits. A. H. BROOKS inquired whether the sketch of the southern Andes made by Willis was intended to imply the presence of a peneplain on top of the Andes. Willis thought that a moderately developed peneplain had existed, although it had not been brought to such a stage but that considerable irregularity had survived. Moreover, a good deal of warping had occurred during elevatory doming. SIDNEY PAIGE referred to Lowthian Green's theory of a tetrahedral earth, and thought that the general unit character of elevation recently undergone by South America tended to support Green's view. A. H. BROOKS inquired as to the origin of fiords along southern coasts. Willis thought they were located in zones of softer rocks which had been cut into by rivers and glaciers. DAVID WHITE inquired whether continental shelves were a marked feature along the southeastern coast where Willis had spoken of recent warping. Willis replied that they were present in some degree of development.

C. N. FENNER, *Secretary.*

THE BIOLOGICAL SOCIETY OF WASHINGTON

The 540th meeting of the Society was held in the Assembly Hall of the Cosmos Club, Saturday, April 17, 1915, with Vice-President ROSE in the chair and 50 persons present.

Under the heading Brief Notes, L. O. HOWARD called attention to the development of mosquito larvae and adults in pools of water formed by melting snow in the mountains of New York state, the eggs having been laid on the ground the previous summer in places where pools would be formed.

The first paper of the regular program was by J. D. HOOD, *Some features in the morphology of the insect order Thysanoptera.* Mr. HOOD gave a general account of the Thysanoptera, called attention to the large amount of systematic work that had been done in it during recent years, and said that it was estimated that about 25,000 forms would be found to exist in the order. He called particular attention to the structure and mechanics of the foot, and to the asymmetrical mouth parts, illustrating the peculiarities of each by diagrams. Mr. HOOD's paper was discussed by Dr. HOWARD.

The second paper was by E. A. GOLDMAN, *Biological explorations in eastern Panama.* Mr. GOLDMAN gave an account of his work in connection with the Smithsonian Biological Survey of the Panama Canal Zone, in 1912, in extreme eastern Panama with a view to determining the faunal relations of that section to the Canal Zone and to western Panama. Very little zoological collecting had previously been done in this region which was scarcely better known than in the 16th Century,

at the time of the Conquest. It proved to be mainly Southern American in faunal characters, with a slight admixture of North and Middle American elements. Many South American species apparently reach their northern limits here. The collections of birds and mammals have been identified, and about 40 of the mammals and 30 of the birds have been described as new. Among the birds are three new genera, two of them of humming birds. No new genera of mammals were taken, but several had not previously been reported from Panama. A new species of *Capybara* was among the more notable mammals. Spiny rats of the genus *Proechimys* were found to be common. The tail, normally long in this animal, is lost through some pathological condition in many individuals, and owing to this circumstance the natives believe in the existence of two species.

GOLDMAN'S paper was illustrated by lantern slide views of the country explored, and of objects pertaining to its natural history. It was discussed by Messrs. WETMORE and LYON.

The third paper was by VERNON BAILEY, *Notes on variation, distribution, and habits of the pocket-gophers of the genus Thomomys*. Mr. BAILEY said these rodents, constituting a genus of the peculiar American family Geomyidae, are distributed over the western United States, extending from Alberta and British Columbia to southern Mexico. They range from the Arctic-Alpine to the Tropical zonal areas and are generally abundant in the regions they inhabit. They are burrowers, live almost entirely underground, and are probably more restricted in their individual habitats than any other of our native mammals. This to some extent accounts for their great range of variation and the large number of recognizable forms, nearly 90. Almost every change in climate, soil, and environment is reflected by some change in the color, size, proportions, or cranial characters. There is wonderful adaptation in their color to that of the soil inhabited by them, varying from creamy white on the light sands of the lower Colorado River flats to dark browns on the volcanic plateaus of Mexico and Arizona, and almost black along the humid Pacific coast region of northwestern California. There is also a pure black form on the coast of Oregon which may be an extreme case of dichromatism, as there are several species with a well marked black phase.

Their habit of burrowing enables the gophers to escape many enemies and to adapt themselves to rigorous climatic conditions. In the past this habit was useful in keeping the soil upturned and "ploughed," but under artificial cultivation by man this habit renders the animals a pest. They are very destructive to root crops, clover, alfalfa, and grain. By cutting roots they often do much damage to orchards, nurseries, and vineyards. They may be destroyed by trapping or on a large scale by placing poisoned food in their burrows. In a revision of the genus just submitted for publication as a number of the North American Fauna a general discussion of the habits is given, as well as descriptions of species and subspecies, and maps showing distribution.